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TITLE: GENERATOR FOR BICYCLE

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ABSTRACT:

PROBLEM TO BE SOLVED: To improve output characteristics of a generator for a bicycle, while suppressing increase in cost.

SOLUTION: This generator for a bicycle comprises a generating coil 22 contained in a yoke 1 and fixed to a hub shaft 1, and a casing 2 rotatably provided to the shaft 1 and arranging a magnet 3 on an inner periphery. In this case, the magnet 3 is rotated at the outside of the coil 22 to generate power. Yoke pieces 17, made of a magnetic material formed into a U-shaped, are laminated to a laminated unit 18. A plurality of the units 18 are arranged at an interval in a circumferential direction to form the yoke 12.

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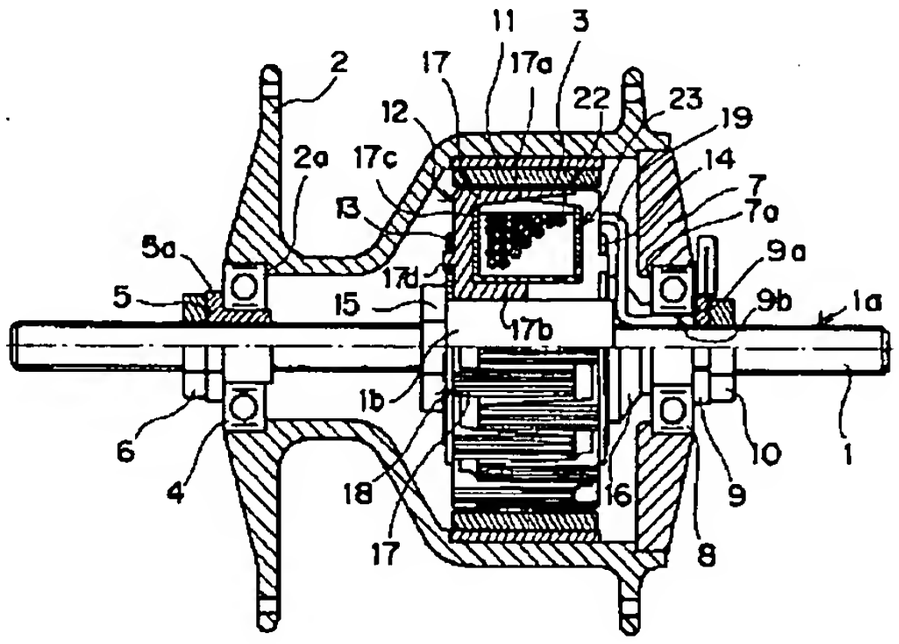
(54)【発明の名称】　自転車用発電機

(57)【要約】
【課題】　自転車用発電機の出力特性をコストアップを抑えつつ改善する。
【解決手段】　ヨーク１２に収容されてハブ軸１に固定された発電コイル２２と、ハブ軸１に対し回転自在に設けられ内周面にマグネット３を配設したケーシング２を備え、発電コイル２２の外側をマグネット３が回転することにより発電を行う。コの字型に形成された磁性体からなるヨーク片１７を積層して積層ユニット１８とし、これを円周方向に間隔を置いて複数配設してヨーク１２を形成する。

図　1



1：ハブ軸　17：ヨーク片
2：ケーシング　18：積層ユニット
3：マグネット　22：発電コイル
12：ヨーク

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【特許請求の範囲】
【請求項１】　磁性体からなるヨークに収容されてハブ軸に固定された発電コイルと、前記ハブ軸に対し回転自在に設けられ、その内周面に永久磁石を配設したハブ体を備え、前記発電コイルの外側を前記永久磁石が回転することにより発電を行う自転車用発電機であって、
前記ヨークは、磁性体からなる板状部材を積層して形成されることを特徴とする自転車用発電機。
【請求項２】　請求項１記載の自転車用発電機において、前記板状部材は対向する二辺とそれらを接続する一辺とを備えたコの字型に形成され、前記二辺部分が前記発電コイルの外周側および内周側に延在することを特徴とする自転車用発電機。
【請求項３】　請求項１または２記載の自転車用発電機において、前記ヨークは、前記板状部材を複数枚積層して形成した積層体を円周方向に間隔を置いて複数配設してなることを特徴とする自転車用発電機。
【請求項４】　請求項３記載の自転車用発電機において、前記発電コイルの内周側に、前記積層体間を接続する磁性体からなるスペーサを設けたことを特徴とする自転車用発電機。
【請求項５】　請求項１～３の何れか１項に記載の自転車用発電機において、前記ハブ軸と前記ヨークとの間に、磁性体からなる円筒部材を積層して形成したブッシュを介設したことを特徴とする自転車用発電機。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、自転車用発電機に関し、特に、車輪のハブに発電機を内蔵させたいわゆるハブダイナモと呼ばれる自転車用発電機に適用して有効な技術に関するものである。
【０００２】
【従来の技術】従来より自転車においては、付設されたライト等に電力を供給するため、車輪の回転を利用して発電を行うタイプの発電機が広く用いられている。また、近年このような自転車用発電機として、車輪を支持する車軸部分に発電機を配設したいわゆるハブダイナモと呼ばれる装置が普及してきている。
【０００３】このハブダイナモは、一般に、車輪側にマグネットを備えたロータを配設し、それをハブ軸側に設けたコイルの周囲にて回転させ発電作用を行うようになっている。図８，９は、このようなハブダイナモ型の従来の自転車用発電機（以下、発電機と略記する）における主要部の構成を示す説明図である。
【０００４】図８の発電機では、車輪側に取り付けられたケーシング（ハブ体）５１の内周にマグネット５２が配される。ケーシング５１内にはリングヨーク５３が取り付けられており、マグネット５２はその内周に固着される。ケーシング５１は、図示しないベアリングによってハブ軸５４に対し回転自在に支承されている。

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【０００５】マグネット５２の内側にはコイルユニット５５が配設される。コイルユニット５５は、ハブ軸５４にスペーサ５６を介して固着され、その外側にはヨーク５７が配設される。ヨーク５７の外周とマグネット５２の内周との間には空隙が形成されている。ヨーク５７は、軸方向に２個のヨーク部材５７ａと５７ｂが組み合わされた形となっており、各ヨーク部材５７ａ，ｂはそれぞれ、底面部５８と側片５９とから構成されている。側片５９は、底面部５８から曲げ加工によって形成され、対向するヨーク部材５７ａ，ｂの側片５９同士がそれぞれ互い違いに組み合わされて、コイルユニット５５の外周を覆うようになっている。
【０００６】一方、図９の発電機では、ケーシング５１側の構成は図８と同様であるが、ヨーク５７の形態が前述のものとは異なっている。つまり、図９の場合には、各ヨーク部材５７ａ，ｂには、絞り加工によって屈曲形成されたコイル保持部６０が設けられている。そして、コイルユニット５５は、このコイル保持部６０によって支持されてヨーク５７内に収容され、図８におけるスペーサ５６は省かれている。
【０００７】
【発明が解決しようとする課題】ここで、発電機における磁路形成に際し、ヨークの板厚が不足すると磁束密度が飽和してしまう箇所が発生する。かかる箇所が生じるとマグネットからの磁束が有効に利用できず、出力電圧を向上させる妨げとなる。これに対し磁束の飽和を防止すべく板厚を大きくすると、高速時においてヨーク内部に発生する渦電流損が大きくなり出力電圧が低下してしまう。従って、ヨークの板厚をバランス良く設定することがヨーク設計の際に大きな問題となる。
【０００８】しかしながら、図８，９のような従来の発電機では、ヨークに曲げや絞り加工部が存在するため、板厚設定の自由度が小さく、また、加工により板厚が変化して全体を均一な厚さに形成できないという問題があった。
【０００９】さらに、曲げや絞り加工を行った部分には塑性加工による残留応力が存在するため、これが磁気の流れを妨げて磁束の有効活用が図れないという問題も生じる。この場合、かかる残留応力はヨークを焼鈍することで低減可能であるが、その際、焼鈍工程が加わることによるコストアップは避けられない。また、焼鈍時の熱によりヨークの寸法が変化するため、そのまま使用すると出力電圧にバラツキが生じるという問題がある。一方、それを再修正すればバラツキは低減するが、修正工程の分だけコストが上昇するという新たな問題が生じる。
【００１０】本発明の目的は、自転車用発電機の出力特性をコストアップを抑えつつ改善することにある。
【００１１】
【課題を解決するための手段】本発明の自転車用発電機

は、磁性体からなるヨークに収容されてハブ軸に固定された発電コイルと、前記ハブ軸に対し回転自在に設けられ、その内周面に永久磁石を配設したハブ体を備え、前記発電コイルの外側を前記永久磁石が回転することにより発電を行う自転車用発電機であって、前記ヨークは、磁性体からなる板状部材を積層して形成されることを特徴とする。

【００１２】これにより、本発明の自転車用発電機では、ヨーク設計上の自由度が大きくなり、磁束の飽和状態を適宜改善することが可能となる。従って、界磁磁束を有効活用することができ、出力向上や装置の小型化を図ることが可能となる。また、ヨークの積層化に伴い、渦電流損が低減し高速時の出力特性を改善することが可能となる。さらに、曲げ加工等を省くことができると共に、熱処理や寸法修正等の後処理も不要となり、部品コストを抑えることが可能となる。加えて、内部歪みの残留等による鉄損を低減でき、無負荷時における回転抵抗を軽減することが可能となる。

【００１３】一方、前記板状部材を、対向する二辺とそれらを接続する一辺とを備えたコの字型に形成し、前記二辺部分が前記発電コイルの外周側および内周側に延在するようにしても良い。また、前記板状部材を複数枚積層して積層体を形成し、それを円周方向に間隔を置いて複数配設して前記ヨークを形成するようにしても良い。

【００１４】さらに、前記発電コイルの内周側に、前記積層体間を接続する磁性体からなるスペーサを設けたり、前記ハブ軸と前記ヨークとの間に、磁性体からなる円筒部材を積層して形成したブッシュを介設したりしても良く、これらにより磁路が強化され、さらに出力特性が改善される。

【００１５】

【発明の実施の形態】（実施の形態１）以下、本発明の実施の形態を図面に基づいて詳細に説明する。図１は、本発明の実施の形態１である発電機の構成を示す断面図である。図１の発電機は、自転車の車輪を支持するハブ軸１に配設されるハブダイナモ形式となっており、ハブ軸１側が固定子となり発電コイル２２が配設される。一方、ハブ軸１には回転子としてケーシング（ハブ体）２が回転自在に設けられており、その内周側にはマグネット（永久磁石）３が取り付けられている。

【００１６】ケーシング２の図１において左端側にはベアリング４が取り付けられている。ベアリング４の内周側にはナット５が挿入されており、ナット５はハブ軸１の外周に形成されたねじ１ａにねじ込まれている。これにより、ケーシング２の左端側は、ベアリング４を介してハブ軸１に回転自在に支持されることになる。ナット５にはフランジ５ａが形成されており、ベアリング４はこのフランジ５ａとケーシング２内の段部２ａとによって軸方向に抜け止めされる。ナット５の外側にはさらにナット６が配設され、ナット５の緩み止めが施されている。

【００１７】ケーシング２の図１において右端側にはパネル７がはめ込まれており、パネル７の中央部にはベアリング８が取り付けられている。ベアリング８の内周側にはナット９が挿入されており、ナット９はハブ軸１の外周に形成されたねじ１ａにねじ込まれている。これにより、ケーシング２の右端側は、パネル７に取り付けられたベアリング８を介してハブ軸１に回転自在に支持される。なお、ナット９にもフランジ９ａが形成されており、ベアリング８はこのフランジ９ａとパネル７内の段部７ａとによって軸方向に抜け止めされる。また、ナット９の外側にはさらにナット１０が配設され、ナット９の緩み止めが施されている。

【００１８】ケーシング２の内周側には、鉄等の磁性材料によって形成された円筒形状のリングヨーク１１が取り付けられている。また、リングヨーク１１の内側には、界磁子として複数個のマグネット３が配設されている。

【００１９】ハブ軸１側には、発電コイル２２がヨーク１２に収容された状態で固定されている。ハブ軸１には大径部１ｂが形成されており、その外周にはヨーク１２が取り付けられ、その内側に発電コイル２２のコイルユニット２３が収容されている。ヨーク１２の外周はマグネット３と若干の間隙を空けて対向しており、ヨーク１２および発電コイル２２の外側をマグネット３が回転するようになっている。なお、発電コイル２２には配線１９が設けられており、この配線１９はナット９に設けられた配線孔９ｂから発電機外部へと引き出されている。

【００２０】ヨーク１２の軸方向外側にはそれぞれヨーク保持板１３，１４が取り付けられている。ヨーク保持板１３の外側（図１において左側）にはナット１５が取り付けられている。また、ヨーク保持板１４の外側（図１において右側）にはナット１６が取り付けられる。そして、両ナット１５，１６によってヨーク１２は大径部１ｂ上に保持、固定される。

【００２１】また、ナット１６は、その図１において右端側がナット９の左端と接するようにハブ軸１に取り付けられる。これにより、ケーシング２内におけるハブ軸１の位置が決まり、発電コイル２２とマグネット３との間の位置関係が決定される。すなわち、マグネット３が位置ずれなく発電コイル２２の外側を回転するように、ケーシング２とハブ軸１とが組み付けられる。

【００２２】ここで、当該発電機におけるヨーク１２は、鉄等の磁性体からなる板状のヨーク片（板状部材）１７から構成される。図２は、ヨーク片１７の構成を示す斜視図である。このヨーク片１７は、プレス等にて鉄板を打ち抜き成形したものであり、従来の装置のように、ヨーク形成に際し曲げ加工や絞り加工は必要ない構成となっている。ヨーク片１７は、図２に示したように略コの字型の鉄片であり、対応する二辺をなす外周部１

７ａと内周部１７ｂと、それらを接続する一辺となる胴部１７ｃから構成される。また、胴部１７ｃには係合突起１７ｄが設けられている。

【００２３】ヨーク片１７は、複数枚積層されて積層ユニット（積層体）１８として用いられる。図３は、積層ユニット１８の構成およびその配設状態を示す説明図である。図３に示したように、積層ユニット１８は、ヨーク片１７の外周部１７ａが外径側に来るようにハブ軸１の大径部１ｂに取り付けられる。そして、この積層ユニット１８を周方向に間隔を置いて複数配設することによりヨーク１２が形成される。

【００２４】また、積層ユニット１８は、図３に示したようにハブ軸１の前後方向（図１において左右方向）から交互に配設される。この場合、発電コイル２２のコイルユニット２３両端面には、積層ユニット１８の幅に形成された図示しないヨーク取付溝が形成されている。そして、コイル前後にて異なる位置の溝に積層ユニット１８を挿入することにより、発電コイル２２の周囲に積層ユニット１８が交互に配設されることになる。

【００２５】このように本発明による発電機では、ヨーク片１７を積層させてヨーク１２を形成しているため、ヨーク片１７の形状や積層枚数を変えることにより磁気回路構成や磁路の断面積を適宜変えることができる。このため、磁束が飽和しがちな部分の断面積を増加させるなど、磁束状態に応じてヨーク形状やその厚さ等を適宜変更することが容易にでき、磁束飽和状態を任意に改善することが可能となる。

【００２６】また、ヨーク製造に際し曲げ加工や絞り加工が不要なため、部品の加工工程を削減でき、さらに、残留応力を除去するための熱処理等も不要となり、部品コストの低減を図ることが可能となる。

【００２７】一方、ヨーク１２の形成に際し、ヨーク片１７の係合突起１７ｄは、ヨーク保持板１３，１４に設けられた係合溝（図示せず）に嵌め込まれる。すなわち、両者を嵌合させることにより、発電コイル２２を取り囲む形で配設された積層ユニット１８にヨーク保持板１３，１４を取り付ける。そして、ヨーク保持板１３，１４をナット１５，１６を締め付けることにより、発電コイル２２およびヨーク１２はハブ軸１上に固定される。

【００２８】このようにして構成された発電機では、ケーシング２が車輪側に固定され、自転車が駆動されると車輪の回転と共に、マグネット３が発電コイル２２の外側を回転するようになる。これにより、発電コイル２２に起電力が発生され、この起電力が発電電力としてライト等の負荷に供給される。この際、当該発電機では、ヨーク１２の積層化により渦電流損が低下するため、高速時の出力特性が改善される。また、ヨーク１２の曲げ加工等がないため、内部歪みによる鉄損が低減され、コギングトルクが減少し無負荷時における回転抵抗も軽減される。

【００２９】（実施の形態２）次に、本発明の実施の形態２である発電機について説明する。図４は、本発明の実施の形態２である発電機の構成を示す断面図である。なお、実施の形態１と同様の部品等については同一の符号を付し、その詳細は省略する。

【００３０】図４の発電機もまたハブダイナモ形式の装置であり、その基本構成は図１の発電機と同様である。但し、当該発電機では、図１の発電機に加えてヨーク１２の内周側に巻ブッシュ２０が設けられており、磁路の強化が図られている。

【００３１】ここで、巻ブッシュ２０は、鉄等の磁性体からなる薄板材を円筒状に成形し積層したものである。図４の発電機では、ハブ軸１の大径部１ｂが図１のものより小径に形成されており、大径部１ｂとヨーク１２との間にこの巻ブッシュ２０が挿入されている。なお、その他の構成は図１の発電機と同様である。

【００３２】当該発電機では、ヨーク１２の内周面に接して巻ブッシュ２０が配置されていることから、ヨーク１２における磁気抵抗が低減されて磁路が強化され、出力の向上が図られている。

【００３３】（実施の形態３）さらに、本発明の実施の形態３である発電機について説明する。図５は、本発明の実施の形態３である発電機の構成を示す断面図である。なお、実施の形態１と同様の部品等については同一の符号を付し、その詳細は省略する。

【００３４】図５の発電機もまたハブダイナモ形式の装置であり、その基本構成は図１の発電機と同様である。但し、当該発電機では、図１の発電機に加えてヨーク１２の内周側にスペーサ２１が設けられており、磁路の強化が図られている。なお、その他の構成は図１の発電機と同様である。

【００３５】この場合、スペーサ２１は鉄等の磁性体からなるリング状部材であり、ヨーク１２の内周面に接して配設されている。このため当該発電機では、ヨーク１２における磁路が強化され、出力の向上が図られている。

【００３６】

【実施例】次に、図８に示した従来の発電機と、図１，４に示した本発明による発電機の発電特性とを比較した実験の結果について説明する。図６はこれらの実験結果のデータを示すグラフであり、（ａ）は従来の装置、（ｂ）は図１の装置、（ｃ）は図４の装置における実験結果を示したものである。さらに、図７は、実験結果のうち有負荷時における出力電圧のみをプロットしたグラフである。

【００３７】この場合、従来の装置と本発明による装置では、高速時の出力特性と、無負荷時の出力特性の２点について改善が見られた。すなわち、まず第１に、図７からわかるように、車速１０ｋｍ／ｈ以上にて従来の発

電機よりも出力電圧が向上した。特に、図４の装置では、ほぼ全速域にて出力向上が見られた。また第２に、図６からわかるように、無負荷時の実測値と計算値との差が大きいのに対し（図６（ａ））、本発明による装置ではそれらはほぼ一致している（図６（ｂ），（ｃ））。これはすなわち、無負荷時の鉄損がほとんどゼロに近くなったことを表し、車輪を回転させる力（ペダルを踏む力）が小さくて済むことを示している。

【００３８】このように本発明による発電機では、ヨーク設計の自由度が大きくなると共に、鉄損の低減により高速域や無負荷時における出力特性の改善を図ることが可能となっている。

【００３９】以上、本発明者によってなされた発明を実施の形態に基づき具体的に説明したが、本発明は前記実施の形態に限定されるものではなく、その要旨を逸脱しない範囲で種々変更可能であることはいうまでもない。

【００４０】たとえば、ヨーク片１７の形状や積層枚数は前述の例には限られず、求められる性能に基づき適宜変更することが可能である。

【００４１】

【発明の効果】本発明の自転車用発電機は、いわゆるハブダイナモ形式の自転車用発電機において、磁性体からなる板状部材を積層してヨークを形成したことにより、ヨーク設計上の自由度が大きくなり、磁束の飽和状態を適宜改善することが可能となる。このためマグネットの磁束を有効活用することができ、出力向上や装置の小型化を図ることが可能となる。また、ヨークの積層化に伴い、渦電流損が低減し高速時の出力特性を改善することが可能となる。

【００４２】さらに、ヨークの曲げ加工等を省くことができると共に、熱処理や寸法修正等の後処理も不要となるため、部品コストを抑えることが可能となる。また、内部歪みの残留等による鉄損を低減できることから、無負荷時における回転抵抗を軽減することが可能となる。

【００４３】一方、発電コイルの内周側に巻ブッシュやスペーサを設けることにより、磁路が強化され、発電機の出力特性をさらに改善することが可能となる。

【図面の簡単な説明】

【図１】本発明の実施の形態１である発電機の構成を示す断面図である。

【図２】ヨーク片の構成を示す斜視図である。

【図３】積層ユニットの構成およびその配設状態を示す説明図である。

【図４】本発明の実施の形態２である発電機の構成を示す断面図である。

【図５】本発明の実施の形態３である発電機の構成を示す断面図である。

【図６】実験結果を示すグラフであり、（ａ）は従来の装置、（ｂ）は図１の装置、（ｃ）は図４の装置における実験結果を示している。

【図７】実験結果のうち有負荷時における出力電圧のみをプロットしたグラフである。

【図８】従来の自転車用発電機の構成を示す断面図である。

【図９】従来の他の自転車用発電機の構成を示す断面図である。

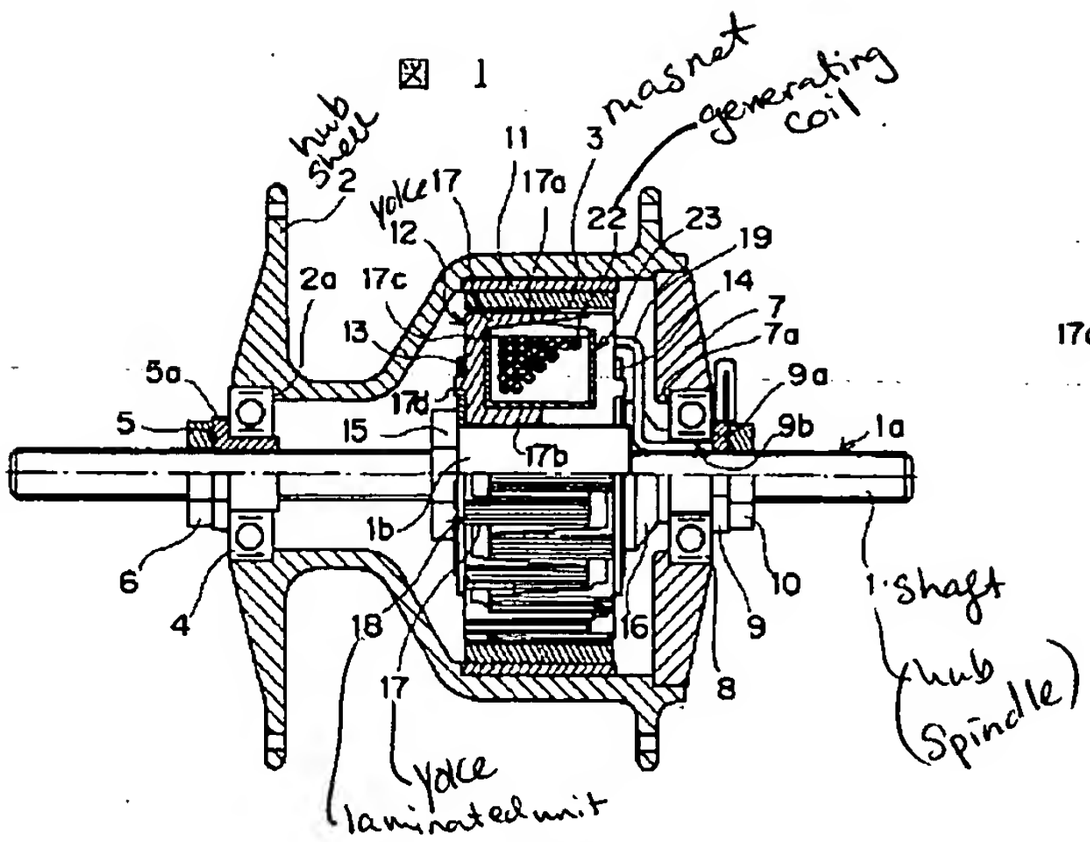
【符号の説明】

１　ハブ軸
１ａ　ねじ
１ｂ　大径部
２　ケーシング（ハブ体）
２ａ　段部
３　マグネット（永久磁石）
４　ベアリング
５　ナット
５ａ　フランジ
６　ナット
７　パネル
７ａ　段部
８　ベアリング
９　ナット
９ａ　フランジ
９ｂ　配線孔
１０　ナット
１１　リングヨーク
１２　ヨーク
１３　ヨーク保持板
１４　ヨーク保持板
１５　ナット
１６　ナット
１７　ヨーク片（板状部材）
１７ａ　外周部
１７ｂ　内周部
１７ｃ　胴部
１７ｄ　係合突起
１８　積層ユニット（積層体）
１９　配線
２０　巻ブッシュ（ブッシュ）
２１　スペーサ
２２　発電コイル
２３　コイルユニット
５１　ケーシング
５２　マグネット
５３　リングヨーク
５４　ハブ軸
５５　コイルユニット
５６　スペーサ
５７　ヨーク
５７ａ　ヨーク部材
５８　側片

58　底面部
59　側片
60　コイル保持部

【図1】

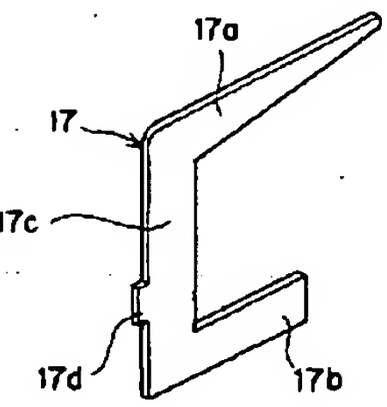
図 1



1：ハブ軸　17：ヨーク片
2：ケーシング　18：積層ユニット
3：マグネット　22：発電コイル
12：ヨーク

【図2】

図 2

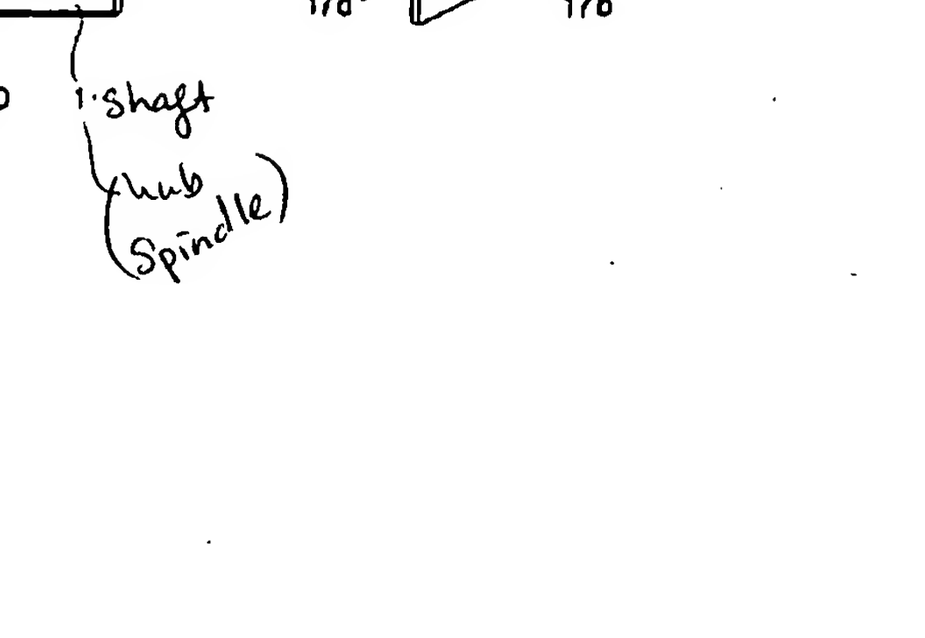


【図3】

図 3

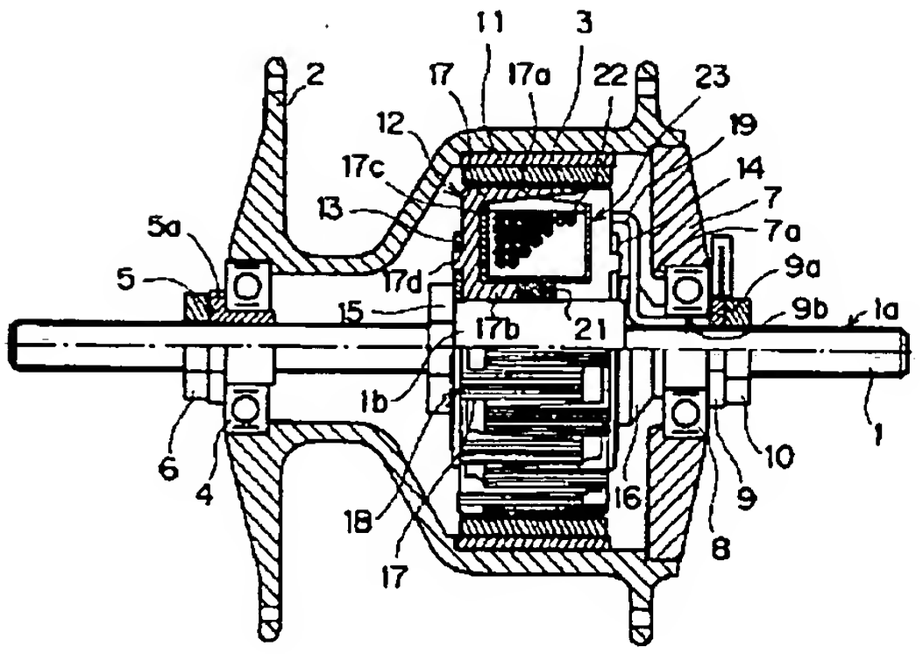
【図4】

図 4



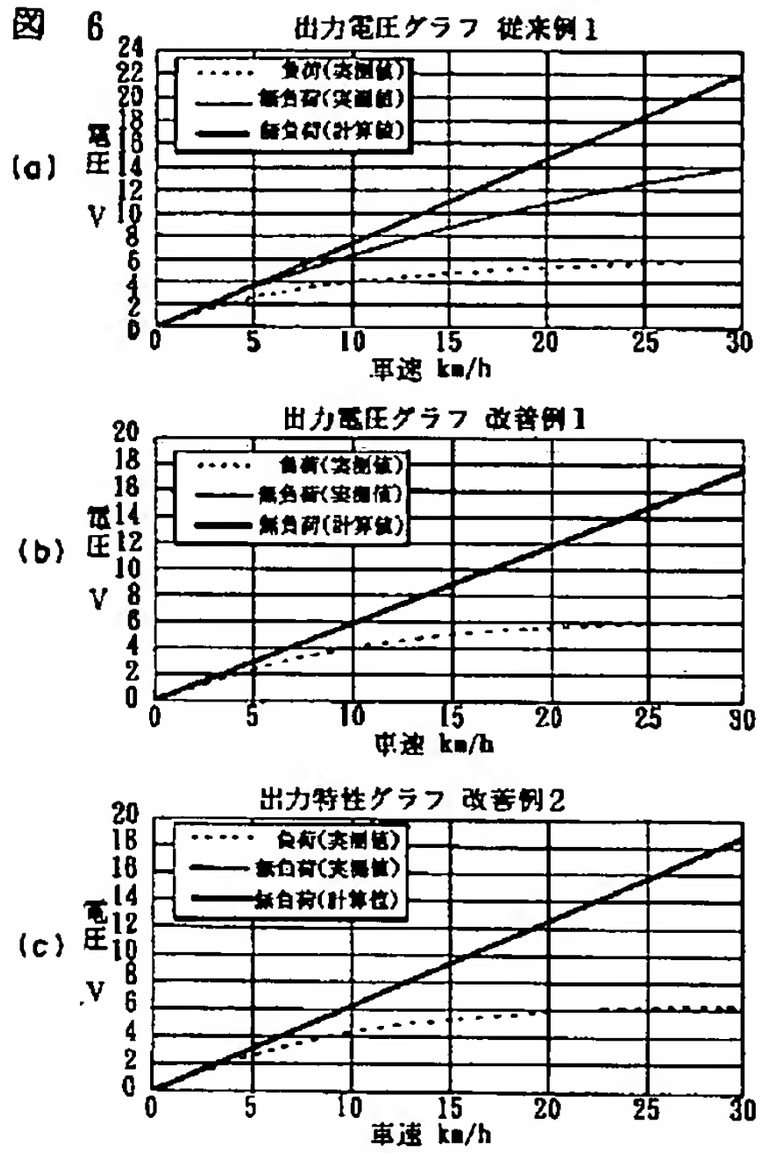
【図5】

図　5



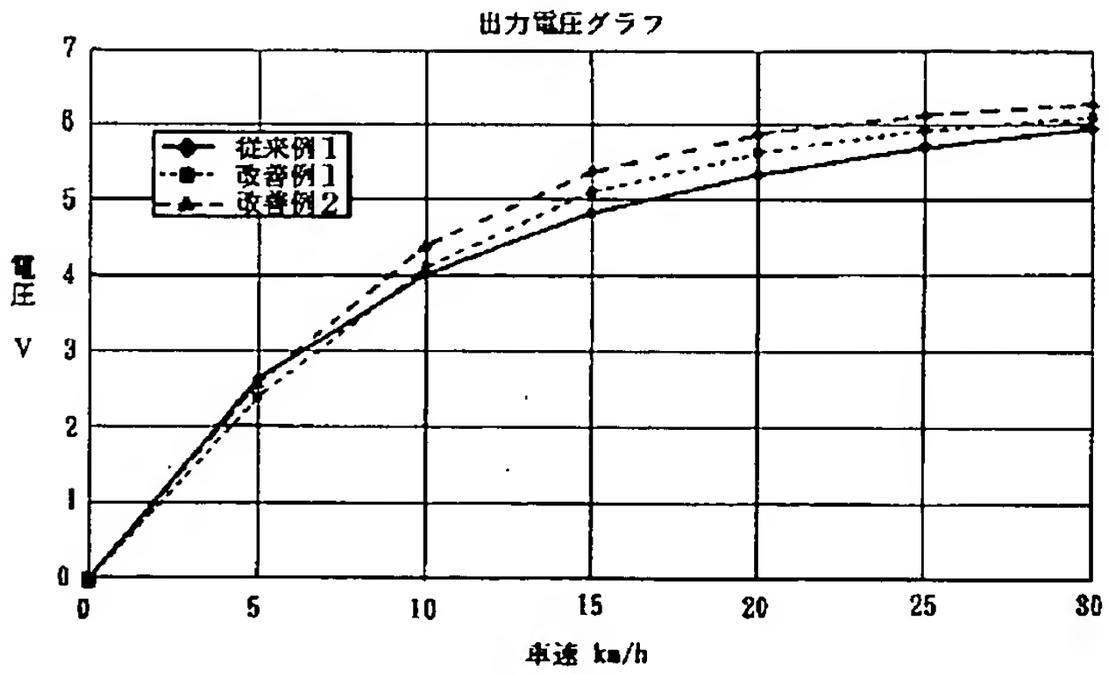
【図6】

図　6



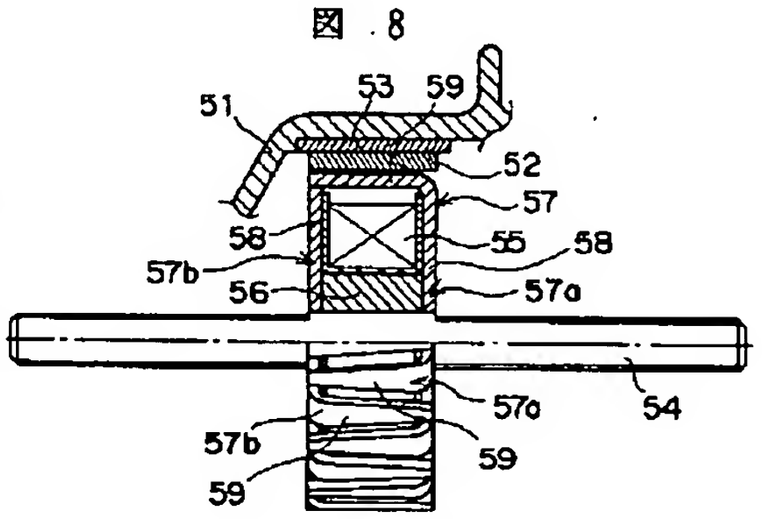
【図7】

図　7



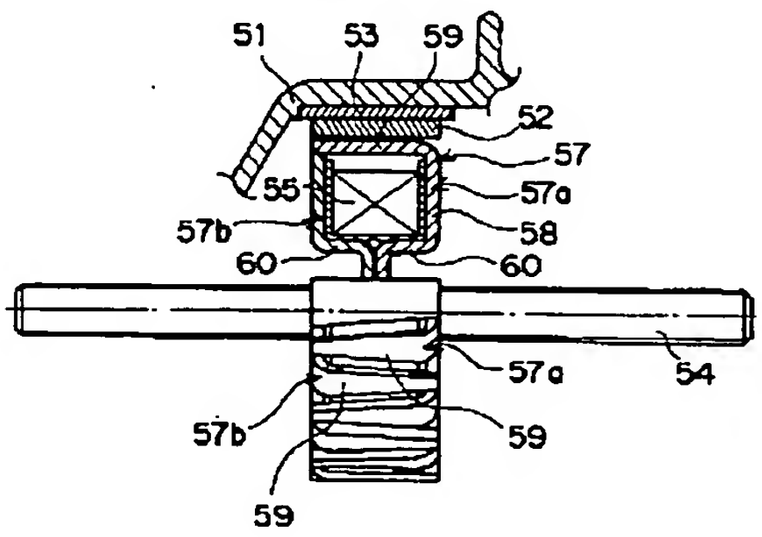
【図8】

図　8



【図9】

図　9



フロントページの続き

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Ｆターム(参考)　5H002 AA07 AB05 AB06 AB08 AC03
AE08

CLAIMS

[Claim(s)]
[Claim 1] It is the generator for bicycles characterized by to be the generator for bicycles which generates electricity when it is prepared free [a revolution] to said hub spindle, it has the hub shell which arranged the permanent magnet in the inner skin and said permanent magnet rotates the outside of said magneto coil, the magneto coil which was held in the yoke which consists of the magnetic substance, and was fixed to the hub spindle, and, and for said yoke to carry out the laminating of the plate-like part material which consists of the magnetic substance, and to form it.
[Claim 2] It is the generator for bicycles characterized by being formed in the character type of KO equipped with two sides which said plate-like part material counters in the generator for bicycles according to claim 1, and one side which connects them, and said two-side part extending in a periphery [of said magneto coil], and inner circumference side.
[Claim 3] It is the generator for bicycles characterized by said yoke keeping spacing in a circumferencial direction, and coming to arrange two or more layered products which carried out two or more sheet laminating of said plate-like part material, and formed it in the generator for bicycles according to claim 1 or 2.
[Claim 4] The generator for bicycles characterized by forming the spacer which consists of the magnetic substance which connects between said layered products to the inner circumference side of said magneto coil in the generator for bicycles according to claim 3.
[Claim 5] The generator for bicycles characterized by interposing in any 1 term of claims 1-3 the bush which carried out the laminating of the body material which consists of the magnetic substance between said hub spindles and said yokes, and formed it in it in the generator for bicycles of a publication.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention is applied to the generator for bicycles called the so-called hub DYNAMO which made the generator build in the hub of a wheel about the generator for bicycles, and relates to an effective technique.
[0002]
[Description of the Prior Art] Conventionally, in order to supply power to the light attached in the bicycle, the generator of the type which generates electricity using the revolution of a wheel is used widely. Moreover, the equipment called the so-called hub DYNAMO which arranged the generator as such [in recent years] a generator for bicycles to the axle part which supports a wheel is spreading.
[0003] Generally arrange Rota which equipped the wheel side with the magnet, it is made to rotate around the coil which prepared it in the hub-spindle side, and this hub DYNAMO performs a generation-of-electrical-energy operation. Drawing 8 and 9 are the explanatory views showing the configuration of the body in the conventional generator for bicycles of such a hub DYNAMO mold (it is hereafter written as a generator).
[0004] With the generator of drawing 8 , a magnet 52 is arranged on the inner circumference of the casing (hub shell) 51 attached in the wheel side. The ring yoke 53 is attached in casing 51, and a magnet 52 fixes to the inner circumference. Casing 51 is supported free [a revolution] to the hub spindle 54 by the bearing which is not illustrated.
[0005] The coil unit 55 is arranged inside a magnet 52. The coil unit 55 fixes through a spacer 56 to a hub spindle 54, and a yoke 57 is arranged in the outside. The opening is formed between the periphery of a yoke 57, and the inner circumference of a magnet 52. The yoke 57 serves as the form where two yoke members 57a and 57b were combined with shaft orientations, and each yoke member 57a and b consist of the base section 58 and a side piece 59, respectively. The side piece 59 is formed of bending from the base section 58, and side piece 59 comrades of yoke member 57a which counters, and b are put together alternately, respectively, and it covers the periphery of the coil unit 55.
[0006] On the other hand, with the generator of drawing 9 , although the configuration by the side of casing 51 is the same as that of drawing 8 , the gestalt of a yoke 57 differs from the above-mentioned thing. That is, in the case of drawing 9 , the coil attaching part 60 crookedness formation was carried out [the attaching part] by spinning is formed at each yoke member 57a and b. And the coil unit 55 is supported by this coil attaching part 60, and is held in a yoke 57, and the spacer 56 in drawing 8 is excluded.
[0007]
[Problem(s) to be Solved by the Invention] If the board thickness of a yoke runs short on the occasion of the magnetic-path formation in a generator here, the part where flux density is saturated will occur.

If this part is generated, magnetic flux from a magnet cannot use effectively, but will serve as hindrance which raises output voltage. On the other hand, if board thickness is enlarged that the saturation of magnetic flux should be prevented, the eddy current loss generated inside York at the time of a high speed will become large, and output voltage will decline. Therefore, it becomes a big problem in case it is a yoke design to set up the board thickness of a yoke with sufficient balance.

[0008] However, with drawing 8 and a conventional generator like 9, since bending and the spinning section existed in a yoke, there was a problem that the degree of freedom of board thickness setting out is small, and board thickness changed with processings and the whole could not be formed in uniform thickness.

[0009] Furthermore, since the residual stress by plastic working exists in the part which performed bending and spinning, this also produces the problem that magnetic flow is barred and effective use of magnetic flux cannot be aimed at. In this case, although this residual stress can be reduced by annealing a yoke, the cost rise by an annealing process being added is not avoided in that case. Moreover, since the dimension of a yoke changes with the heat at the time of annealing, when it is used as it is, the problem that variation arises is in output voltage. On the other hand, although variation will be reduced if it is re-corrected, the new problem that cost goes up produces only the part of a correction process.

[0010] The object of this invention is to improve the output characteristics of the generator for bicycles, suppressing a cost rise.

[0011]

[Means for Solving the Problem] It is the generator for bicycles which generates electricity when it is prepared free [a revolution] to said hub spindle, it has the hub shell which arranged the permanent magnet in the inner skin and said permanent magnet rotates the outside of said magneto coil, the magneto coil which the generator for bicycles of this invention was held in the yoke which consists of the magnetic substance, and was fixed to the hub spindle, and, and said yoke is characterized by to carry out the laminating of the plate-like part material which consists of the magnetic substance, and to be formed.

[0012] Thereby, with the generator for bicycles of this invention, the degree of freedom on a yoke design becomes large, and becomes possible [improving the saturation state of magnetic flux suitably]. Therefore, field magnetic flux can be used effectively and it becomes possible to attain the improvement in an output, and the miniaturization of equipment. Moreover, it becomes possible for eddy current loss to decrease and to improve the output characteristics at the time of a high speed with lamination of a yoke. Furthermore, while being able to exclude bending etc., after treatment, such as heat treatment and dimension correction, also becomes unnecessary, and becomes possible [holding down components cost]. In addition, the iron loss by the residual of internal distortion etc. can be reduced, and it becomes possible to mitigate the rotational resistance at the time of no-load.

[0013] It forms in the character type of KO equipped with two sides which counter said plate-like part material, and one side which connects them on the other hand, and you may make it said two-side part extend in a periphery [of said magneto coil], and inner circumference side. Moreover, two or more sheet laminating of said plate-like part material is carried out, and a layered product is formed, and spacing is kept in a circumferencial direction, two or more they are arranged, and you may make it form said yoke.

[0014] Furthermore, the spacer which consists of the magnetic substance which connects between said layered products to the inner circumference side of said magneto coil may be formed, or the bush which carried out the laminating of the body material which consists of the magnetic substance between said hub spindles and said yokes, and formed it in it may be interposed, a magnetic path is strengthened by these, and output characteristics are improved further.

[0015]
[Embodiment of the Invention] (Gestalt 1 of operation) The gestalt of operation of this invention is hereafter explained to a detail based on a drawing. Drawing 1 is the sectional view showing the configuration of the generator which is the gestalt 1 of operation of this invention. The generator of drawing 1 serves as a hub DYNAMO format arranged by the hub spindle 1 which supports the wheel of a bicycle, a hub-spindle 1 side serves as a stator, and a magneto coil 22 is arranged. On the other hand, casing (hub shell) 2 is formed in the hub spindle 1 free [a revolution] as a rotator, and the magnet (permanent magnet) 3 is attached in the inner circumference side.
[0016] The bearing 4 is attached in the left end side in drawing 1 of casing 2. The nut 5 is inserted in the inner circumference side of a bearing 4, and the nut 5 is thrust into screw-thread 1a formed in the periphery of a hub spindle 1. By this, the left end side of casing 2 will be supported by the hub spindle 1 free [a revolution] through a bearing 4. Flange 5a is formed in the nut 5, and the stop of the bearing 4 is escaped from and carried out to shaft orientations by this flange 5a and step 2a in casing 2. A nut 6 is further arranged in the outside of a nut 5, and locking of a nut 5 is given.
[0017] The panel 7 is inserted in right one end in drawing 1 of casing 2, and the bearing 8 is attached in the center section of the panel 7. The nut 9 is inserted in the inner circumference side of a bearing 8, and the nut 9 is thrust into screw-thread 1a formed in the periphery of a hub spindle 1. Thereby, right one end of casing 2 is supported by the hub spindle 1 free [a revolution] through the bearing 8 attached in the panel 7. In addition, flange 9a is formed also in the nut 9, and the stop of the bearing 8 is escaped from and carried out to shaft orientations by this flange 9a and step 7a in a panel 7. Moreover, a nut 10 is further arranged in the outside of a nut 9, and locking of a nut 9 is given.
[0018] The ring yoke 11 of the shape of a cylindrical shape formed with magnetic materials, such as iron, is attached in the inner circumference side of casing 2. Moreover, inside the ring yoke 11, two or more magnets 3 are arranged as a field child.
[0019] It is fixed to the hub-spindle 1 side where a magneto coil 22 is held in a yoke 12. Major diameter 1b is formed in the hub spindle 1, a yoke 12 is attached in the periphery, and the coil unit 23 of a magneto coil 22 is held in the inside. The periphery of a yoke 12 vacated the gap of a magnet 3 and a some, and has countered, and a magnet 3 rotates the outside of a yoke 12 and a magneto coil 22. In addition, wiring 19 is formed in the magneto coil 22, and this wiring 19 is pulled out in the generator exterior from wiring hole 9b prepared in the nut 9.
[0020] The yoke maintenance plate 13 and 14 are attached in the shaft-orientations outside of a yoke 12, respectively. The nut 15 is attached in the outside (it sets to drawing 1 and is left-hand side) of the yoke maintenance plate 13. Moreover, a nut 16 is attached in the outside (it sets to drawing 1 R> 1, and is right-hand side) of the yoke maintenance plate 14. And a yoke 12 is held and fixed by both the nuts 15 and 16 on major diameter 1b.
[0021] Moreover, a nut 16 is attached in a hub spindle 1 so that right one end may touch the left end of a nut 9 in the drawing 1 . Thereby, the location of the hub spindle 1 in casing 2 is decided, and the physical relationship between a magneto coil 22 and a magnet 3 is determined. That is, casing 2 and a hub spindle 1 are attached so that a magnet 3 may rotate the outside of a magneto coil 22 without a location gap.
[0022] Here, the yoke 12 in the generator concerned consists of tabular yoke pieces (plate-like part material) 17 which consist of the magnetic substance, such as iron. Drawing 2 is the perspective view showing the configuration of the yoke piece 17. This yoke piece 17 pierces and fabricates a griddle with a press etc., and bending and spinning have unnecessary composition on the occasion of yoke formation like conventional equipment. The yoke piece 17 is a character type piece of iron of abbreviation KO, as shown in drawing 2 , and it consists of drum section 17c used as one side which

connects them with periphery section 17a and inner circumference section 17b which make two corresponding sides. Moreover, 17d of engagement projections is prepared in drum section 17c.

[0023] Two or more sheet laminating of the yoke piece 17 is carried out, and it is used as a laminating unit (layered product) 18. Drawing 3 is the explanatory view showing the configuration and its arrangement condition of the laminating unit 18. As shown in drawing 3 , the laminating unit 18 is attached in major diameter 1b of a hub spindle 1 so that periphery section 17a of the yoke piece 17 may come to an outer-diameter side. And a yoke 12 is formed by keeping spacing in a hoop direction and arranging two or more these laminating units 18 in it.

[0024] Moreover, the laminating unit 18 is arranged by turns from the cross direction (it sets to drawing 1 and is a longitudinal direction) of a hub spindle 1, as shown in drawing 3 . In this case, the yoke mounting slot which was formed in the width of face of the laminating unit 18 and which is not illustrated is formed in the 23 coil unit end face of a magneto coil 22. And the laminating unit 18 will be arranged in the perimeter of a magneto coil 22 by turns by inserting the laminating unit 18 in the slot of a different location before and behind a coil.

[0025] Thus, since the laminating of the yoke piece 17 is carried out and the yoke 12 is formed, the cross section of a magnetic-circuit configuration or a magnetic path is changeable with the generator by this invention, suitably by changing the configuration and laminating number of sheets of the yoke piece 17. For this reason, the thing for which a yoke configuration, its thickness, etc. are suitably changed according to a magnetic-flux condition, such as making the cross section of the part with which magnetic flux tends to be saturated increase etc., can be performed easily, and it becomes possible to improve a magnetic-flux saturation state to arbitration.

[0026] Moreover, on the occasion of yoke manufacture, since bending and spinning are unnecessary, the processing processes of components are reducible, and heat treatment for removing residual stress etc. becomes unnecessary, and becomes possible [aiming at reduction of components cost] further.

[0027] On the other hand, on the occasion of formation of a yoke 12, 17d of engagement projections of the yoke piece 17 is inserted in the yoke maintenance plate 13 and the engagement slot (not shown) established in 14. That is, the yoke maintenance plate 13 and 14 are attached in the laminating unit 18 arranged in the form which encloses a magneto coil 22 by carrying out fitting of both. And a magneto coil 22 and a yoke 12 are fixed on a hub spindle 1 by binding a nut 15 and 16 tight in the yoke maintenance plates 13 and 14.

[0028] Thus, with the constituted generator, casing 2 is fixed to a wheel side, and if a bicycle drives, a magnet 3 will come to rotate the outside of a magneto coil 22 with the revolution of a wheel. Thereby, electromotive force is generated by the magneto coil 22 and this electromotive force is supplied to loads, such as a light, as generated output. Under the present circumstances, with the generator concerned, since eddy current loss falls by lamination of a yoke 12, the output characteristics at the time of a high speed are improved. Moreover, since there is no bending of a yoke 12 etc., the iron loss by internal distortion is reduced, cogging torque decreases and the rotational resistance at the time of no-load is also mitigated.

[0029] (Gestalt 2 of operation) Next, the generator which is the gestalt 2 of operation of this invention is explained. Drawing 4 is the sectional view showing the configuration of the generator which is the gestalt 2 of operation of this invention. In addition, the sign same about the same components as the gestalt 1 of operation is attached, and the detail is omitted.

[0030] The generator of drawing 4 is also equipment of a hub DYNAMO format, and the basic configuration is the same as that of the generator of drawing 1 . However, with the generator concerned, in addition to the generator of drawing 1 , the Maki bush 20 is established in the inner circumference side of a yoke 12, and the magnetic path is strengthened.

[0031] Here, the sheet metal material which consists of the magnetic substance, such as iron, is

fabricated in the shape of a cylinder, and the Maki bush 20 carries out a laminating. With the generator of drawing 4 , major diameter 1b of a hub spindle 1 is formed in the minor diameter from the thing of drawing 1 , and this Maki bush 20 is inserted between major diameter 1b and a yoke 12. In addition, other configurations are the same as that of the generator of drawing 1 .

[0032] With the generator concerned, since the Maki bush 20 is arranged in contact with the inner skin of a yoke 12, the magnetic reluctance in a yoke 12 is reduced, a magnetic path is strengthened, and improvement in an output is achieved.

[0033] (Gestalt 3 of operation) The generator which is the gestalt 3 of operation of this invention is explained further. Drawing 5 is the sectional view showing the configuration of the generator which is the gestalt 3 of operation of this invention. In addition, the sign same about the same components as the gestalt 1 of operation is attached, and the detail is omitted.

[0034] The generator of drawing 5 is also equipment of a hub DYNAMO format, and the basic configuration is the same as that of the generator of drawing 1 . However, with the generator concerned, in addition to the generator of drawing 1 , the spacer 21 is formed in the inner circumference side of a yoke 12, and the magnetic path is strengthened. In addition, other configurations are the same as that of the generator of drawing 1 .

[0035] In this case, a spacer 21 is a ring-like member which consists of the magnetic substance, such as iron, and is arranged in contact with the inner skin of a yoke 12. For this reason, the magnetic path in a yoke 12 is strengthened with the generator concerned, and improvement in an output is achieved with it.

[0036]

[Example] Next, the result of the experiment which compared the generation-of-electrical-energy property of the conventional generator shown in drawing 8 and the generator by drawing 1 and this invention shown in 4 is explained. Drawing 6 is a graph which shows the data of these experimental results, and (a) shows an experimental result [in / conventional equipment and (b), and / in (c) / the equipment of drawing 4]. [the equipment of drawing 1] Furthermore, drawing 7 is the graph which plotted only the output voltage at the time of an owner load among experimental results.

[0037] In this case, with conventional equipment and the equipment by this invention, the improvement was found about two points, the output characteristics at the time of a high speed, and the output characteristics at the time of no-load. That is, output voltage improved rather than the conventional generator with 10 or more km/h of vehicle speed so that drawing 7 might show [1st] first. Especially, with the equipment of drawing 4 , the improvement in an output was found mostly in the full speed region. Moreover, with the equipment by this invention, they are mostly in agreement to a thing (drawing 6 (a)) with the large difference of the actual measurement at the time of no-load, and calculated value so that drawing 6 may show [2nd] (drawing 6 (b) and (c)). It means that the iron loss of this, at i.e., the time of no-load, became almost close to zero, and it is shown that the force (force which steps on a pedal) of rotating a wheel is small, and ends.

[0038] Thus, while the degree of freedom of a yoke design becomes large with the generator by this invention, it is possible to aim at an improvement of the output characteristics at the time of a high-speed region or no-load by reduction of iron loss.

[0039] As mentioned above, although invention made by this invention person was concretely explained based on the gestalt of operation, it cannot be overemphasized that it can change variously in the range which this invention is not limited to the gestalt of said operation, and does not deviate from the summary.

[0040] For example, the configuration and laminating number of sheets of the yoke piece 17 can be suitably changed into the above-mentioned example based on the engine performance which is not

restricted but is called for.

[0041]

[Effect of the Invention] In the so-called generator for bicycles of a hub DYNAMO format, by having carried out the laminating of the plate-like part material which consists of the magnetic substance, and having formed the yoke, the degree of freedom on a yoke design becomes large, and the generator for bicycles of this invention becomes possible [improving the saturation state of magnetic flux suitably]. For this reason, the magnetic flux of a magnet can be used effectively and it becomes possible to attain the improvement in an output, and the miniaturization of equipment. Moreover, it becomes possible for eddy current loss to decrease and to improve the output characteristics at the time of a high speed with lamination of a yoke.

[0042] Furthermore, since after treatment, such as heat treatment and dimension correction, also becomes unnecessary while being able to exclude bending of a yoke etc., it becomes possible to hold down components cost. Moreover, since the iron loss by the residual of internal distortion etc. can be reduced, it becomes possible to mitigate the rotational resistance at the time of no-load.

[0043] On the other hand, by forming the Maki bush and a spacer in the inner circumference side of a magneto coil, a magnetic path is strengthened and it becomes possible to improve the output characteristics of a generator further.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] Especially this invention is applied to the generator for bicycles called the so-called hub DYNAMO which made the generator build in the hub of a wheel about the generator for bicycles, and relates to an effective technique.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Conventionally, in order to supply power to the light attached in the bicycle, the generator of the type which generates electricity using the revolution of a wheel is used widely. Moreover, the equipment called the so-called hub DYNAMO which arranged the generator as such [in recent years] a generator for bicycles to the axle part which supports a wheel is spreading.

[0003] Generally arrange Rota which equipped the wheel side with the magnet, it is made to rotate around the coil which prepared it in the hub-spindle side, and this hub DYNAMO performs a generation-of-electrical-energy operation. Drawing 8 and 9 are the explanatory views showing the configuration of the body in the conventional generator for bicycles of such a hub DYNAMO mold (it is hereafter written as a generator).

[0004] With the generator of drawing 8 , a magnet 52 is arranged on the inner circumference of the casing (hub shell) 51 attached in the wheel side. The ring yoke 53 is attached in casing 51, and a magnet 52 fixes to the inner circumference. Casing 51 is supported free [a revolution] to the hub spindle 54 by the bearing which is not illustrated.

[0005] The coil unit 55 is arranged inside a magnet 52. The coil unit 55 fixes through a spacer 56 to a hub spindle 54, and a yoke 57 is arranged in the outside. The opening is formed between the periphery of a yoke 57, and the inner circumference of a magnet 52. The yoke 57 serves as the form where two yoke members 57a and 57b were combined with shaft orientations, and each yoke member 57a and b consist of the base section 58 and a side piece 59, respectively. The side piece 59 is formed of bending from the base section 58, and side piece 59 comrades of yoke member 57a which counters, and b are put together alternately, respectively, and it covers the periphery of the coil unit 55.

[0006] On the other hand, with the generator of drawing 9 , although the configuration by the side of casing 51 is the same as that of drawing 8 , the gestalt of a yoke 57 differs from the above-mentioned thing. That is, in the case of drawing 9 , the coil attaching part 60 crookedness formation was carried out [the attaching part] by spinning is formed at each yoke member 57a and b. And the coil unit 55 is supported by this coil attaching part 60, and is held in a yoke 57, and the spacer 56 in drawing 8 is excluded.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] In the so-called generator for bicycles of a hub DYNAMO format, by having carried out the laminating of the plate-like part material which consists of the magnetic substance, and having formed the yoke, the degree of freedom on a yoke design becomes large, and the generator for bicycles of this invention becomes possible [improving the saturation state of magnetic flux suitably]. For this reason, the magnetic flux of a magnet can be used effectively and it becomes possible to attain the improvement in an output, and the miniaturization of equipment. Moreover, it becomes possible for eddy current loss to decrease and to improve the output characteristics at the time of a high speed with lamination of a yoke.
[0042] Furthermore, since after treatment, such as heat treatment and dimension correction, also becomes unnecessary while being able to exclude bending of a yoke etc., it becomes possible to hold down components cost. Moreover, since the iron loss by the residual of internal distortion etc. can be reduced, it becomes possible to mitigate the rotational resistance at the time of no-load.
[0043] On the other hand, by forming the Maki bush and a spacer in the inner circumference side of a magneto coil, a magnetic path is strengthened and it becomes possible to improve the output characteristics of a generator further.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] If the board thickness of a yoke runs short on the occasion of the magnetic-path formation in a generator here, the part where flux density is saturated will occur. If this part is generated, magnetic flux from a magnet cannot use effectively, but will serve as hindrance which raises output voltage. On the other hand, if board thickness is enlarged that the saturation of magnetic flux should be prevented, the eddy current loss generated inside York at the time of a high speed will become large, and output voltage will decline. Therefore, it becomes a big problem in case it is a yoke design to set up the board thickness of a yoke with sufficient balance.

[0008] However, with drawing 8 and a conventional generator like 9, since bending and the spinning section existed in a yoke, there was a problem that the degree of freedom of board thickness setting out is small, and board thickness changed with processings and the whole could not be formed in uniform thickness.

[0009] Furthermore, since the residual stress by plastic working exists in the part which performed bending and spinning, this also produces the problem that magnetic flow is barred and effective use of magnetic flux cannot be aimed at. In this case, although this residual stress can be reduced by annealing a yoke, the cost rise by an annealing process being added is not avoided in that case. Moreover, since the dimension of a yoke changes with the heat at the time of annealing, when it is used as it is, the problem that variation arises is in output voltage. On the other hand, although variation will be reduced if it is re-corrected, the new problem that cost goes up produces only the part of a correction process.

[0010] The object of this invention is to improve the output characteristics of the generator for bicycles, suppressing a cost rise.

[Translation done.]

MEANS

[Means for Solving the Problem] It is the generator for bicycles which generates electricity when it is prepared free [a revolution] to said hub spindle, it has the hub shell which arranged the permanent magnet in the inner skin and said permanent magnet rotates the outside of said magneto coil, the magneto coil which the generator for bicycles of this invention was held in the yoke which consists of the magnetic substance, and was fixed to the hub spindle, and, and said yoke is characterized by to carry out the laminating of the plate-like part material which consists of the magnetic substance, and to be formed.

[0012] Thereby, with the generator for bicycles of this invention, the degree of freedom on a yoke design becomes large, and becomes possible [improving the saturation state of magnetic flux suitably]. Therefore, field magnetic flux can be used effectively and it becomes possible to attain the improvement in an output, and the miniaturization of equipment. Moreover, it becomes possible for eddy current loss to decrease and to improve the output characteristics at the time of a high speed with lamination of a yoke. Furthermore, while being able to exclude bending etc., after treatment, such as heat treatment and dimension correction, also becomes unnecessary, and becomes possible [holding down components cost]. In addition, the iron loss by the residual of internal distortion etc. can be reduced, and it becomes possible to mitigate the rotational resistance at the time of no-load.

[0013] It forms in the character type of KO equipped with two sides which counter said plate-like part material, and one side which connects them on the other hand, and you may make it said two-side part extend in a periphery [of said magneto coil], and inner circumference side. Moreover, two or more sheet laminating of said plate-like part material is carried out, and a layered product is formed, and spacing is kept in a circumferencial direction, two or more they are arranged, and you may make it form said yoke.

[0014] Furthermore, the spacer which consists of the magnetic substance which connects between said layered products to the inner circumference side of said magneto coil may be formed, or the bush which carried out the laminating of the body material which consists of the magnetic substance between said hub spindles and said yokes, and formed it in it may be interposed, a magnetic path is strengthened by these, and output characteristics are improved further.

[0015]

[Embodiment of the Invention] (Gestalt 1 of operation) The gestalt of operation of this invention is hereafter explained to a detail based on a drawing. Drawing 1 is the sectional view showing the configuration of the generator which is the gestalt 1 of operation of this invention. The generator of drawing 1 serves as a hub DYNAMO format arranged by the hub spindle 1 which supports the wheel of a bicycle, a hub-spindle 1 side serves as a stator, and a magneto coil 22 is arranged. On the other hand, casing (hub shell) 2 is formed in the hub spindle 1 free [a revolution] as a rotator, and the magnet (permanent magnet) 3 is attached in the inner circumference side.

[0016] The bearing 4 is attached in the left end side in drawing 1 of casing 2. The nut 5 is inserted in the inner circumference side of a bearing 4, and the nut 5 is thrust into screw-thread 1a formed in the periphery of a hub spindle 1. By this, the left end side of casing 2 will be supported by the hub spindle 1 free [a revolution] through a bearing 4. Flange 5a is formed in the nut 5, and the stop of the bearing 4 is escaped from and carried out to shaft orientations by this flange 5a and step 2a in casing 2. A nut 6 is further arranged in the outside of a nut 5, and locking of a nut 5 is given.

[0017] The panel 7 is inserted in right one end in drawing 1 of casing 2, and the bearing 8 is attached in the center section of the panel 7. The nut 9 is inserted in the inner circumference side of a bearing 8, and the nut 9 is thrust into screw-thread 1a formed in the periphery of a hub spindle 1. Thereby, right one end of casing 2 is supported by the hub spindle 1 free [a revolution] through the bearing 8 attached in the panel 7. In addition, flange 9a is formed also in the nut 9, and the stop of the bearing 8 is escaped from and carried out to shaft orientations by this flange 9a and step 7a in a panel 7. Moreover, a nut 10 is further arranged in the outside of a nut 9, and locking of a nut 9 is given.

[0018] The ring yoke 11 of the shape of a cylindrical shape formed with magnetic materials, such as iron, is attached in the inner circumference side of casing 2. Moreover, inside the ring yoke 11, two or more magnets 3 are arranged as a field child.

[0019] It is fixed to the hub-spindle 1 side where a magneto coil 22 is held in a yoke 12. Major diameter 1b is formed in the hub spindle 1, a yoke 12 is attached in the periphery, and the coil unit 23 of a magneto coil 22 is held in the inside. The periphery of a yoke 12 vacated the gap of a magnet 3 and a some, and has countered, and a magnet 3 rotates the outside of a yoke 12 and a magneto coil 22. In addition, wiring 19 is formed in the magneto coil 22, and this wiring 19 is pulled out in the generator exterior from wiring hole 9b prepared in the nut 9.

[0020] The yoke maintenance plate 13 and 14 are attached in the shaft-orientations outside of a yoke 12, respectively. The nut 15 is attached in the outside (it sets to drawing 1 and is left-hand side) of the yoke maintenance plate 13. Moreover, a nut 16 is attached in the outside (it sets to drawing 1 R> 1, and is right-hand side) of the yoke maintenance plate 14. And a yoke 12 is held and fixed by both the nuts 15 and 16 on major diameter 1b.

[0021] Moreover, a nut 16 is attached in a hub spindle 1 so that right one end may touch the left end of a nut 9 in the drawing 1 . Thereby, the location of the hub spindle 1 in casing 2 is decided, and the physical relationship between a magneto coil 22 and a magnet 3 is determined. That is, casing 2 and a hub spindle 1 are attached so that a magnet 3 may rotate the outside of a magneto coil 22 without a location gap.

[0022] Here, the yoke 12 in the generator concerned consists of tabular yoke pieces (plate-like part material) 17 which consist of the magnetic substance, such as iron. Drawing 2 is the perspective view showing the configuration of the yoke piece 17. This yoke piece 17 pierces and fabricates a griddle with a press etc., and bending and spinning have unnecessary composition on the occasion of yoke formation like conventional equipment. The yoke piece 17 is a character type piece of iron of abbreviation KO, as shown in drawing 2 , and it consists of drum section 17c used as one side which connects them with periphery section 17a and inner circumference section 17b which make two corresponding sides. Moreover, 17d of engagement projections is prepared in drum section 17c.

[0023] Two or more sheet laminating of the yoke piece 17 is carried out, and it is used as a laminating unit (layered product) 18. Drawing 3 is the explanatory view showing the configuration and its arrangement condition of the laminating unit 18. As shown in drawing 3 , the laminating unit 18 is attached in major diameter 1b of a hub spindle 1 so that periphery section 17a of the yoke piece 17 may come to an outer-diameter side. And a yoke 12 is formed by keeping spacing in a hoop direction and arranging two or more these laminating units 18 in it.

[0024] Moreover, the laminating unit 18 is arranged by turns from the cross direction (it sets to drawing 1 and is a longitudinal direction) of a hub spindle 1, as shown in drawing 3 . In this case, the yoke mounting slot which was formed in the width of face of the laminating unit 18 and which is not illustrated is formed in the 23 coil unit end face of a magneto coil 22. And the laminating unit 18 will be arranged in the perimeter of a magneto coil 22 by turns by inserting the laminating unit 18 in the slot of a different location before and behind a coil.
[0025] Thus, since the laminating of the yoke piece 17 is carried out and the yoke 12 is formed, the cross section of a magnetic-circuit configuration or a magnetic path is changeable with the generator by this invention, suitably by changing the configuration and laminating number of sheets of the yoke piece 17. For this reason, the thing for which a yoke configuration, its thickness, etc. are suitably changed according to a magnetic-flux condition, such as making the cross section of the part with which magnetic flux tends to be saturated increase etc., can be performed easily, and it becomes possible to improve a magnetic-flux saturation state to arbitration.
[0026] Moreover, on the occasion of yoke manufacture, since bending and spinning are unnecessary, the processing processes of components are reducible, and heat treatment for removing residual stress etc. becomes unnecessary, and becomes possible [aiming at reduction of components cost] further.
[0027] On the other hand, on the occasion of formation of a yoke 12, 17d of engagement projections of the yoke piece 17 is inserted in the yoke maintenance plate 13 and the engagement slot (not shown) established in 14. That is, the yoke maintenance plate 13 and 14 are attached in the laminating unit 18 arranged in the form which encloses a magneto coil 22 by carrying out fitting of both. And a magneto coil 22 and a yoke 12 are fixed on a hub spindle 1 by binding a nut 15 and 16 tight in the yoke maintenance plates 13 and 14.
[0028] Thus, with the constituted generator, casing 2 is fixed to a wheel side, and if a bicycle drives, a magnet 3 will come to rotate the outside of a magneto coil 22 with the revolution of a wheel. Thereby, electromotive force is generated by the magneto coil 22 and this electromotive force is supplied to loads, such as a light, as generated output. Under the present circumstances, with the generator concerned, since eddy current loss falls by lamination of a yoke 12, the output characteristics at the time of a high speed are improved. Moreover, since there is no bending of a yoke 12 etc., the iron loss by internal distortion is reduced, cogging torque decreases and the rotational resistance at the time of no-load is also mitigated.
[0029] (Gestalt 2 of operation) Next, the generator which is the gestalt 2 of operation of this invention is explained. Drawing 4 is the sectional view showing the configuration of the generator which is the gestalt 2 of operation of this invention. In addition, the sign same about the same components as the gestalt 1 of operation is attached, and the detail is omitted.
[0030] The generator of drawing 4 is also equipment of a hub DYNAMO format, and the basic configuration is the same as that of the generator of drawing 1 . However, with the generator concerned, in addition to the generator of drawing 1 , the Maki bush 20 is established in the inner circumference side of a yoke 12, and the magnetic path is strengthened.
[0031] Here, the sheet metal material which consists of the magnetic substance, such as iron, is fabricated in the shape of a cylinder, and the Maki bush 20 carries out a laminating. With the generator of drawing 4 , major diameter 1b of a hub spindle 1 is formed in the minor diameter from the thing of drawing 1 , and this Maki bush 20 is inserted between major diameter 1b and a yoke 12. In addition, other configurations are the same as that of the generator of drawing 1 .
[0032] With the generator concerned, since the Maki bush 20 is arranged in contact with the inner skin of a yoke 12, the magnetic reluctance in a yoke 12 is reduced, a magnetic path is strengthened, and improvement in an output is achieved.
[0033] (Gestalt 3 of operation) The generator which is the gestalt 3 of operation of this invention is

explained further. Drawing 5 is the sectional view showing the configuration of the generator which is the gestalt 3 of operation of this invention. In addition, the sign same about the same components as the gestalt 1 of operation is attached, and the detail is omitted.

[0034] The generator of drawing 5 is also equipment of a hub DYNAMO format, and the basic configuration is the same as that of the generator of drawing 1 . However, with the generator concerned, in addition to the generator of drawing 1 , the spacer 21 is formed in the inner circumference side of a yoke 12, and the magnetic path is strengthened. In addition, other configurations are the same as that of the generator of drawing 1 .

[0035] In this case, a spacer 21 is a ring-like member which consists of the magnetic substance, such as iron, and is arranged in contact with the inner skin of a yoke 12. For this reason, the magnetic path in a yoke 12 is strengthened with the generator concerned, and improvement in an output is achieved with it.

[Translation done.]

EXAMPLE

[Example] Next, the result of the experiment which compared the generation-of-electrical-energy property of the conventional generator shown in drawing 8 and the generator by drawing 1 and this invention shown in 4 is explained. Drawing 6 is a graph which shows the data of these experimental results, and (a) shows an experimental result [in / conventional equipment and (b), and / in (c) / the equipment of drawing 4]. [the equipment of drawing 1] Furthermore, drawing 7 is the graph which plotted only the output voltage at the time of an owner load among experimental results.
[0037] In this case, with conventional equipment and the equipment by this invention, the improvement was found about two points, the output characteristics at the time of a high speed, and the output characteristics at the time of no-load. That is, output voltage improved rather than the conventional generator with 10 or more km/h of vehicle speed so that drawing 7 might show [1st] first. Especially, with the equipment of drawing 4 , the improvement in an output was found mostly in the full speed region. Moreover, with the equipment by this invention, they are mostly in agreement to a thing (drawing 6 (a)) with the large difference of the actual measurement at the time of no-load, and calculated value so that drawing 6 may show [2nd] (drawing 6 (b) and (c)). It means that the iron loss of this, at i.e., the time of no-load, became almost close to zero, and it is shown that the force (force which steps on a pedal) of rotating a wheel is small, and ends.
[0038] Thus, while the degree of freedom of a yoke design becomes large with the generator by this invention, it is possible to aim at an improvement of the output characteristics at the time of a high-speed region or no-load by reduction of iron loss.
[0039] As mentioned above, although invention made by this invention person was concretely explained based on the gestalt of operation, it cannot be overemphasized that it can change variously in the range which this invention is not limited to the gestalt of said operation, and does not deviate from the summary.
[0040] For example, the configuration and laminating number of sheets of the yoke piece 17 can be suitably changed into the above-mentioned example based on the engine performance which is not restricted but is called for.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing the configuration of the generator which is the gestalt 1 of operation of this invention.

[Drawing 2] It is the perspective view showing the configuration of a yoke piece.

[Drawing 3] It is the explanatory view showing the configuration and its arrangement condition of a laminating unit.

[Drawing 4] It is the sectional view showing the configuration of the generator which is the gestalt 2 of operation of this invention.

[Drawing 5] It is the sectional view showing the configuration of the generator which is the gestalt 3 of operation of this invention.

[Drawing 6] It is the graph which shows an experimental result and (a) shows the experimental result [in / conventional equipment and (b), and / in (c) / the equipment of drawing 4]. [the equipment of drawing 1]

[Drawing 7] It is the graph which plotted only the output voltage at the time of an owner load among experimental results.

[Drawing 8] It is the sectional view showing the configuration of the conventional generator for bicycles.

[Drawing 9] It is the sectional view showing the configuration of other conventional generators for bicycles.

[Description of Notations]

1 Hub Spindle
1a Screw thread
1b Major diameter
2 Casing (Hub Shell)
2a Step
3 Magnet (Permanent Magnet)
4 Bearing
5 Nut
5a Flange
6 Nut
7 Panel
7a Step
8 Bearing
9 Nut

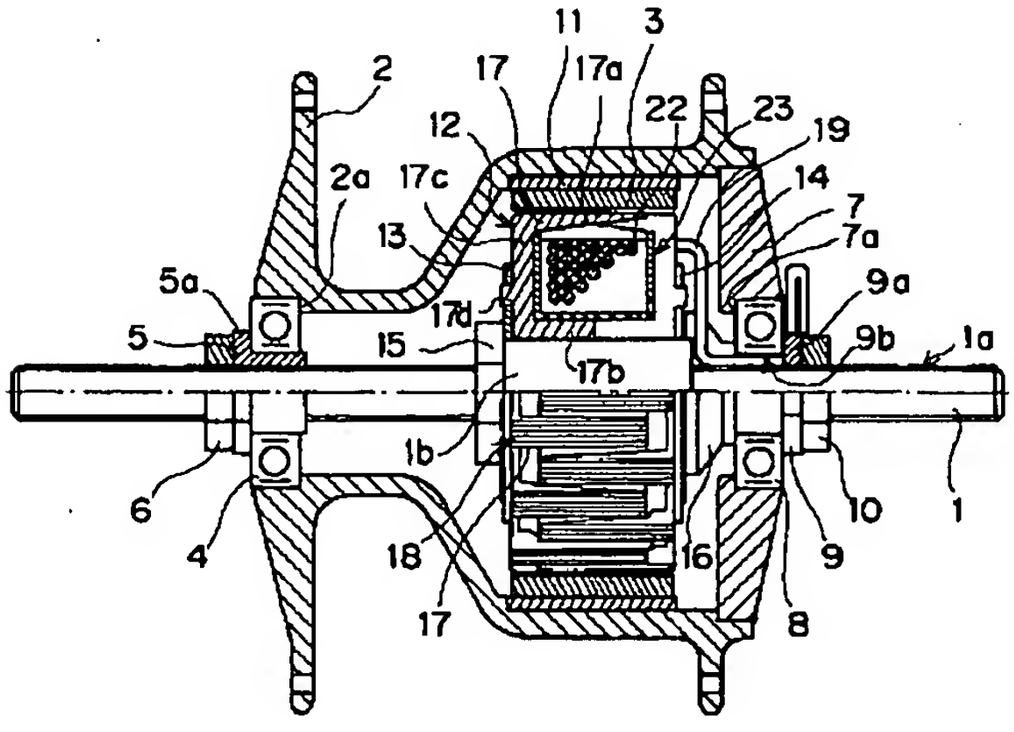
9a Flange
9b Wiring hole
10 Nut
11 Ring Yoke
12 Yoke
13 Yoke Maintenance Plate
14 Yoke Maintenance Plate
15 Nut
16 Nut
17 Yoke Piece (Plate-like Part Material)
17a Periphery section
17b Inner circumference section
17c Drum section
17d Engagement projection
18 Laminating Unit (Layered Product)
19 Wiring
20 Maki Bush (Bush)
21 Spacer
22 Magneto Coil
23 Coil Unit
51 Casing
52 Magnet
53 Ring Yoke
54 Hub Spindle
55 Coil Unit
56 Spacer
57 Yoke
57a Yoke member
58 Side Piece
58 Base Section
59 Side Piece
60 Coil Attaching Part

[Translation done.]

DRAWINGS

[Drawing 1]

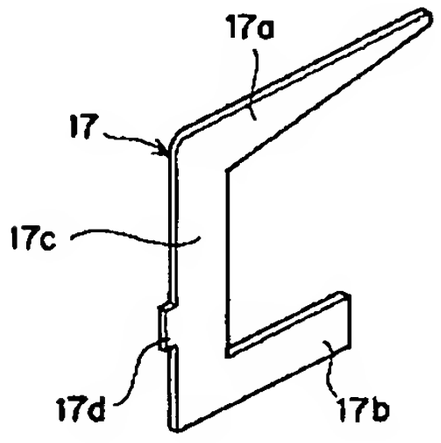
図 1



1：ハブ軸　17：ヨーク片
2：ケーシング　18：積層ユニット
3：マグネット　22：発電コイル
12：ヨーク

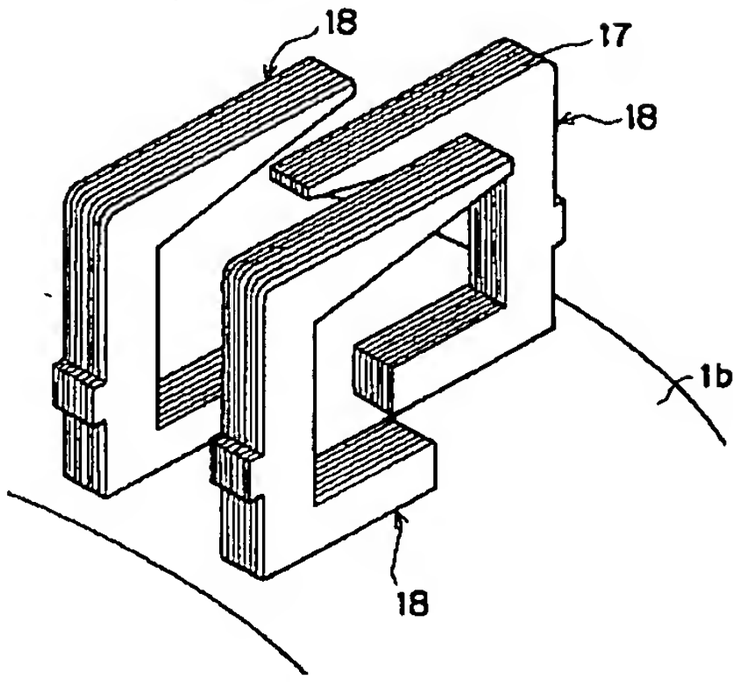
[Drawing 2]

図 2



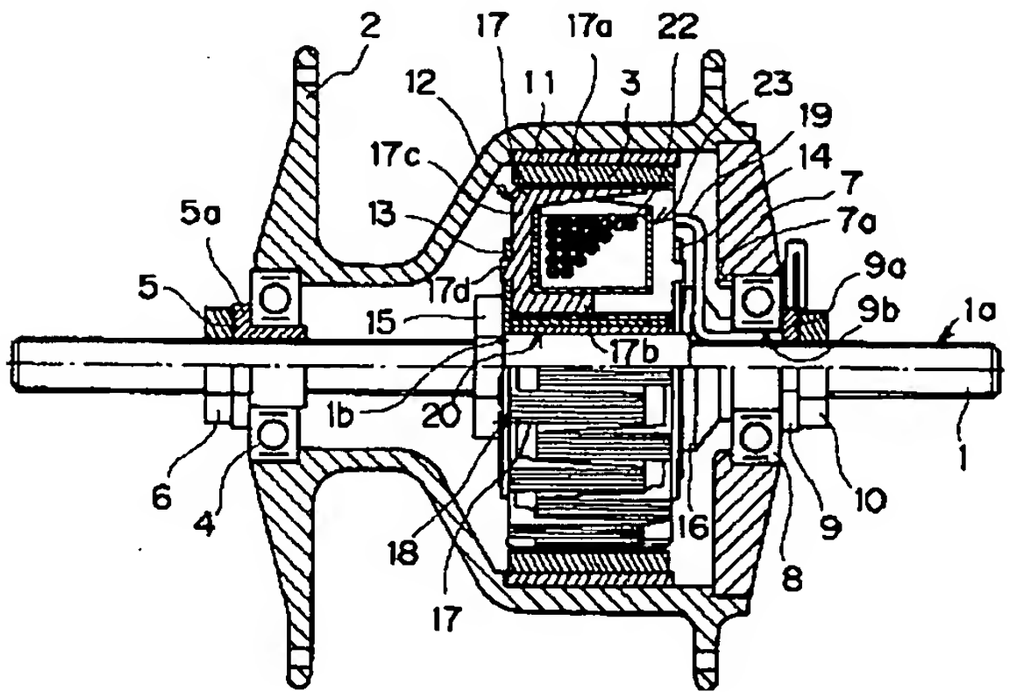
[Drawing 3]

図 3



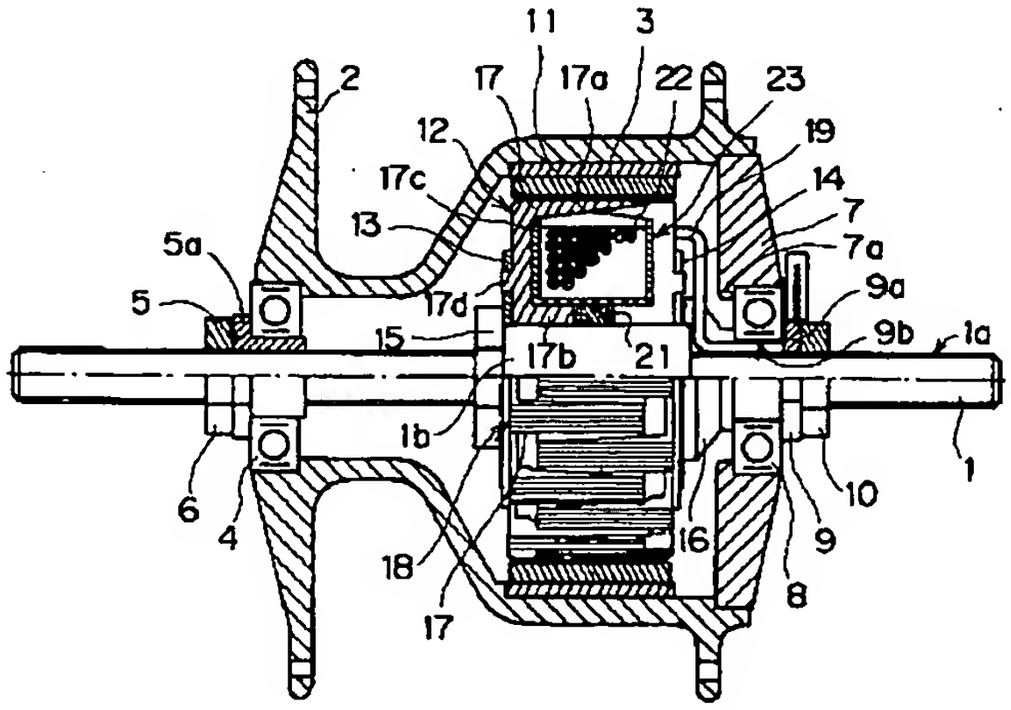
[Drawing 4]

図 4



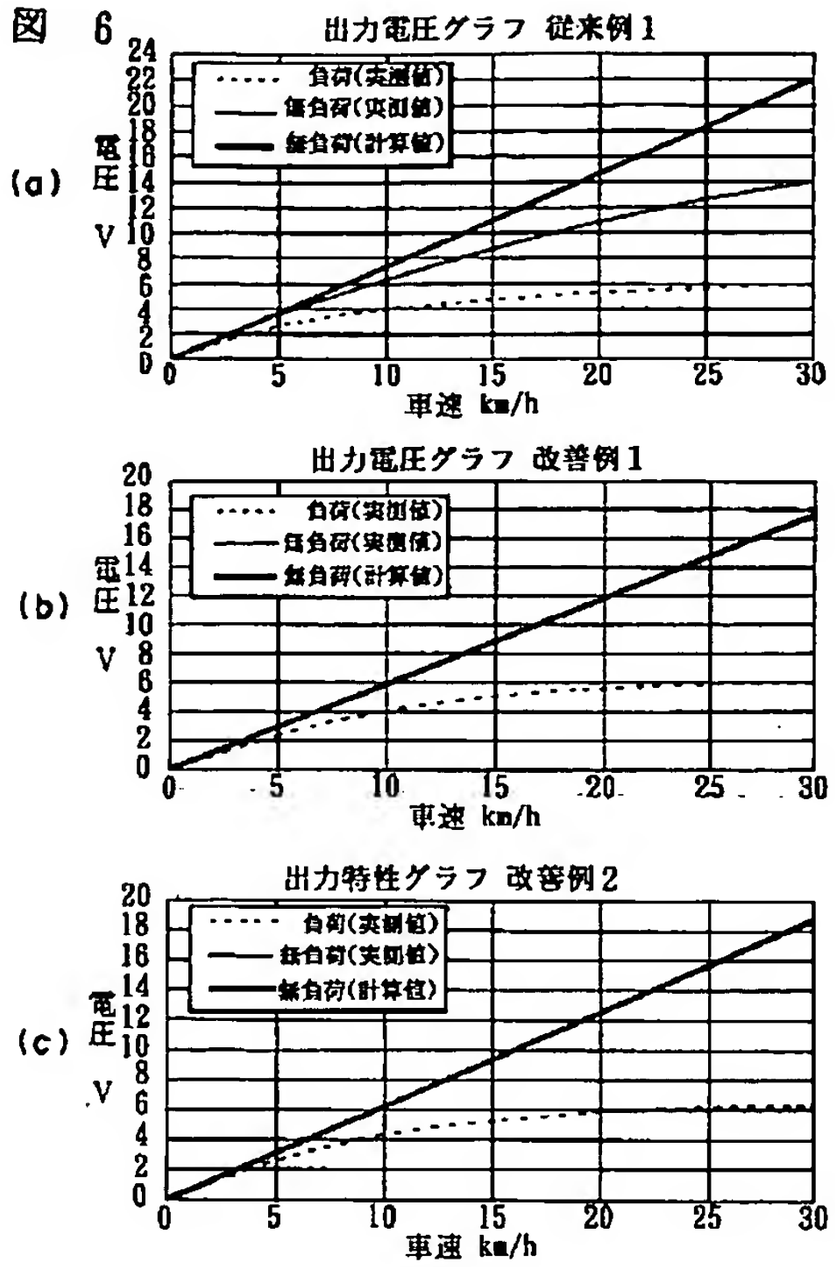
[Drawing 5]

図 5



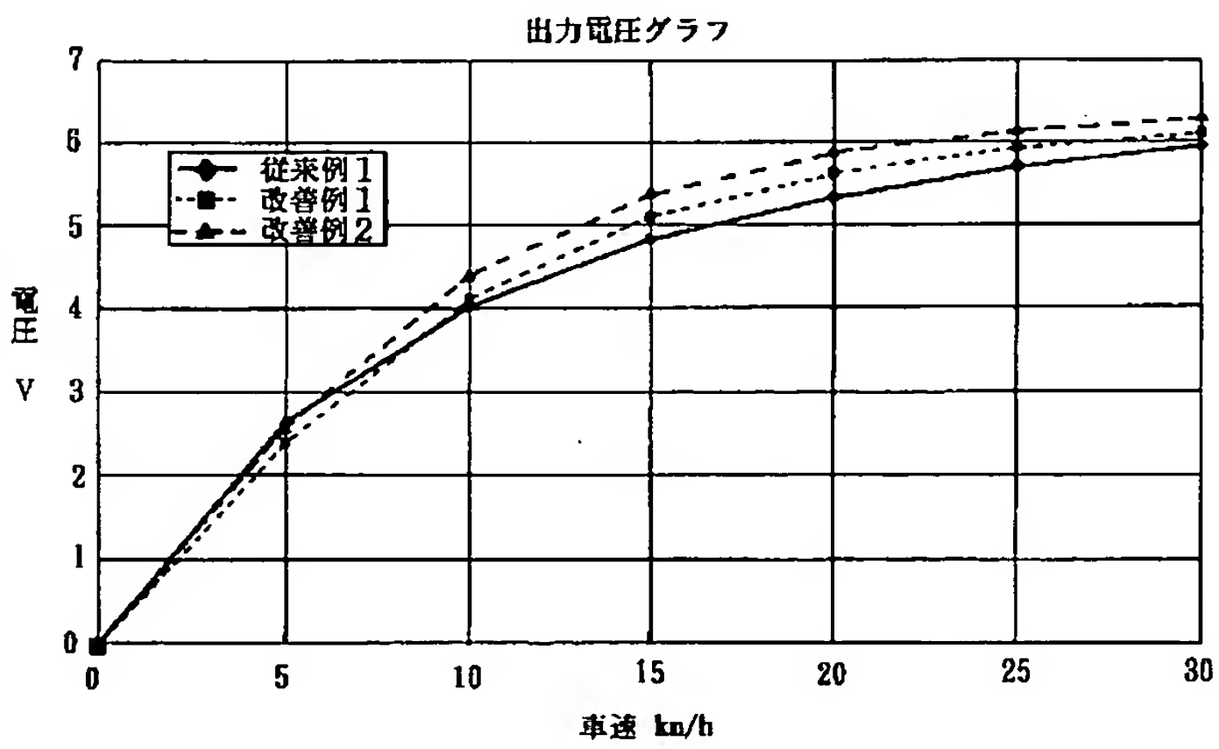
[Drawing 6]

図 6



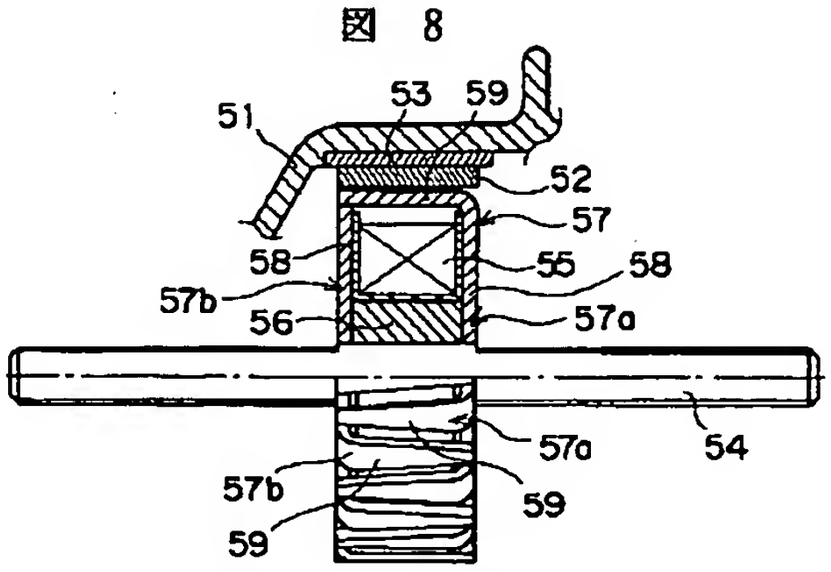
[Drawing 7]

図 7



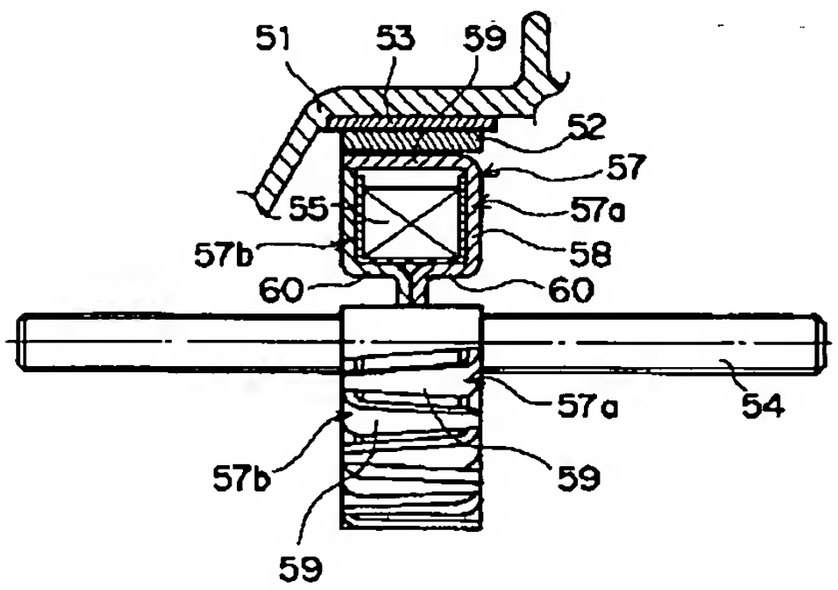
[Drawing 8]

図 8



[Drawing 9]

図 9



[Translation done.]